LOCATIONS OF CATLLE SHELTER IN RELATION TO INDOOR DENSITIES OF *Anopheles aconitus* MALARIA VECTOR IN CENTRAL JAVA

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ABSTRAK

Penelitian untuk mengamati pengaruh berbagai cara penempatan ternak (kerbau) terhadap kepadatan vektor malaria Anopheles aconitus *di dalam rumah telah dilakukan di Desa Kaligading, Kecamatan Boja, Kabupaten Kendal, Jawa Tengah.*

Hasil penelitian menunjukkan bahwa penempatan kandang ternak (kerbau, sapi) di dalam dan menempel pada rumah, meningkatkan kepadatan An. aconitus *yang menggigit orang di dalam rumah, masing-masing 6,1 dan 3,7 kali dibandingkan dengan rumah tanpa ternak. Penempatan kerbau atau sapi 20 meter di luar rumah, dapat menurunkan kepadatan populasi* An. aconitus, *masing- masing 2,8 dan 5,2 kali dibandingkan rumah dengan kandang ternak menempel dan rumah dengan ternak di dalam.*

INTRODUCTION

In Indonesia particularly Java, *Anopheles aconitus* is the most important vector for malaria. This species is highly zoophilic, and over 90 percent of the population depend on blood meal from bovids!

Because of prolonged use of DDT since 1957, this species developed resistance to DDT as reported first in Central Java in 1965[2] To improve vector control methods, alternative insecticides and several methods of application have been suggested[3]. However, many insecticide problems have been detected such as development of vector resistance, the community's reluctance in accepting routine spraying in the houses, etc. To cope with these problems, other control methods based on the vector bionomics are being considered[4].

The present paper will report the results of a study conducted in an effort to investigate those aspects of *An. aconitus* behaviour related to cattle and to determine the effect on indoors human vector contact in relation to various location of cattle shelter.

MATERIAL AND METHODS

1. Study Area

Kaligading village, Boja subdistrict was selected for the study. This area is located 27 km South - West of Semarang, in the Northern foothills of Mount Ungaran, at an elevation of about 390 meters. The climate is warm and

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humid with temperatures of 20°C minimum to 32°C maximum and an annual rainfall of about 300 mm. Kaligading area is agricultural, with rice as the most important crop, which is extensively a larval habitat of *An. aconitus*. Other crops are casava, sweet potatoes, peanuts, fruits such as papaya, bananas, etc. grown near houses. Kaligading village contains about 20 hamlets, 7071 people. 1254 houses and 153 cattle shelters. The study hamlet Kaligading Krajan, has a population of 617 with 154 houses and 16 cattle shelters containing 19 buffaloes and 32 cows. The area is about 12 km persegi and is shown on the map (Figure 1).

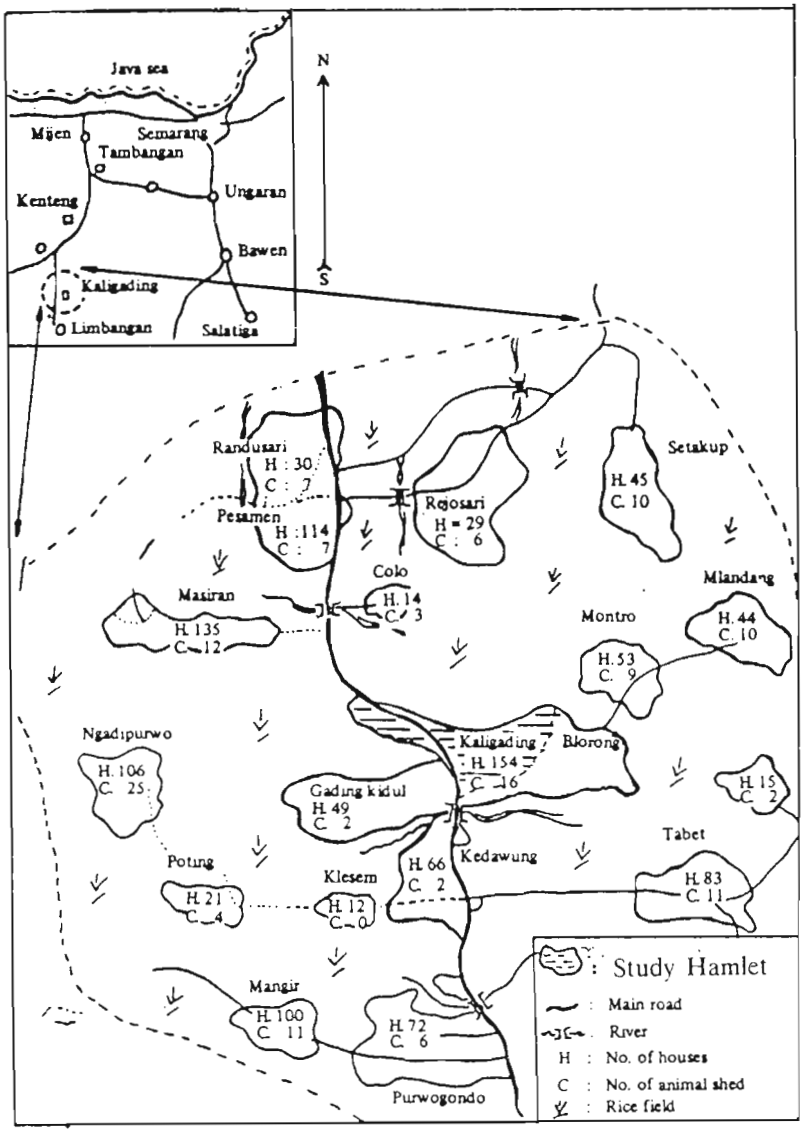
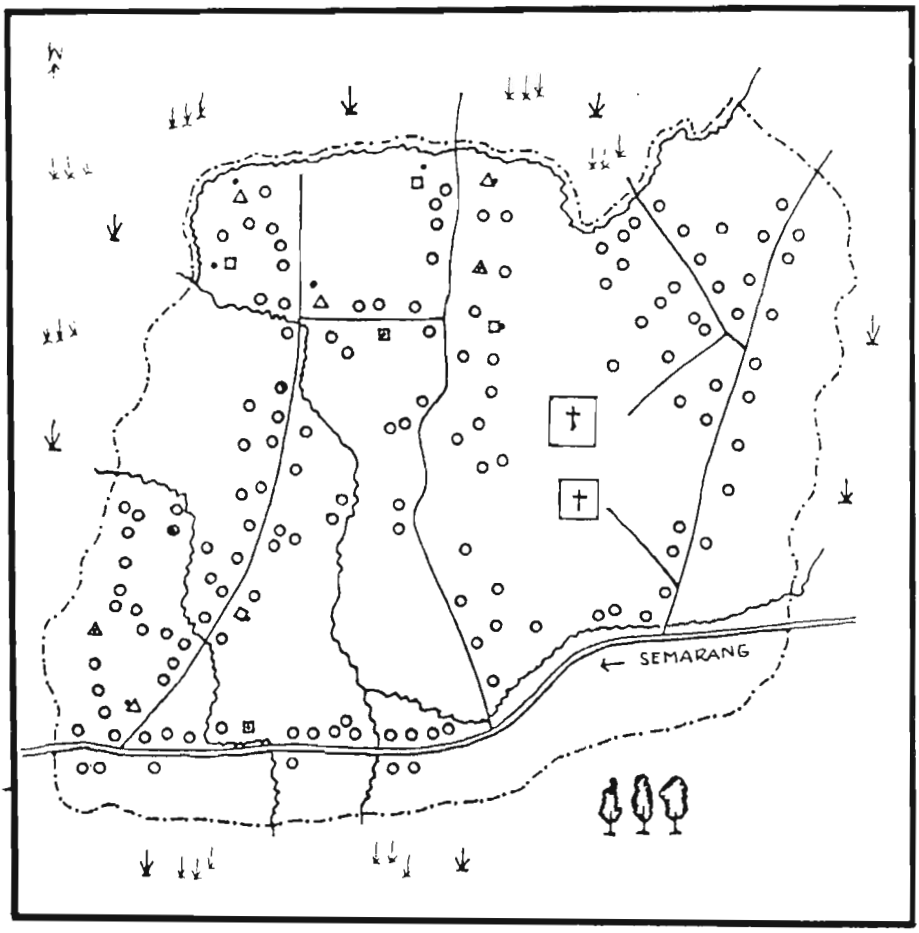


Figure 1. Map showing the Study Area, Kaligading Village

2. Method

A total of 14 houses selected for the study consisted of : i) Four houses, where cattle shelters were closed, located inside the building as part of the house; ii) Four houses, where cattle shelters were attached to the house; iii) Four houses, where cattle shelters were located about 20 meters from the main building and completely open and iv) The remaining two houses, where no cattle shelters existed was used for comparison. Two buffaloes or cows were placed in two different cattle shelters at the same location. The location of selected houses are shown on the map (Figure 2).



- Rice fields, breeding habitat of An. aconitus
- Rubber estate
- Houses with cows shelter
- Houses with buffaloes shelter
- Untreated houses
- Cattle shelter inside
- Cattle shelter attached
- Cattle shelter 20 meters
- distance from the dwellings

Figure 2. Map of Kaligading Hamlet, showing the houses selected and location of the cattle shelters

3. Entomological Evaluation

The study was conducted from February till June 1986, the season known to be major peak of *An. aconitus* (Joshi et al., 1977). Densities of *An. aconitus* in both treated and untreated houses were determined by forthnightly collections as follows : i) Indoor landing on man by one collector in each treated and untreated house from 18.00 - 24.00 hours. ii) Indoor resting catches where one collector each searched in treated or untreated houses from 06.00 - 07.00 hours Newman Keuls Test was used for statistical analysis.

4.. Precipitin Test

A total of 100 blood-fed specimens of *An. aconitus* collected during day time along stream banks and irrigation ditches were fixed on filter paper and sent for analysis in Vector Control Research, Pondicherry - India.

RESULT AND DISCUSSION

The highest density of *An. aconitus* both landing on man and resting indoors was found in the houses with cattle shelter inside, i.e. 3.52 per-man/hour and 11.40 per-man/hour respectively. Indoor landing rates on man where the cattle shelters are located inside and attached to the house were 3.52 per-man/hour and 2.18 per-man/hour respectively. The ratio of indoor landing rates on man where the cattle shelter was located inside, and attached to the house were respectively 6.1 and 3.7 times higher than houses without cattle shelter (Table 1).

Table 1. Night indoor landing and Morning indoor resting densities (per- man/hour) of **Anopheles aconitus**.

Treatment of houses	Indoor landing		Indoor resting	
	Density	Ratio	Density	Ratio
Without cattle shelter	0.58	1.0	2.68	1.0
Cattle shelter 20 meters distance from dwellings	0.52	0.9	2.50	0.9
Cattle shelter attached	2.18	3.7	5.83	2.2
Cattle shelter inside	3.52	6.1	11.30	4.2

These results were significantly different (P) to the houses without cattle and houses with cattle shelter located 20 meters from the dwellings. It shows that man-malaria vector contact in the houses with cattle inside and houses with cattle shelters attached to the house, increased, thus also increasing the possibility of the malaria transmission. However if the cattle shelter located at distance of 20 meters approximately from the dwillings, the vector density is significantly reduced. The reduction of *An. aconitus* density landing on man indoor were 5.2 and 2.8 times respectively compared to cattle shelter inside and attached to the house. These results indicate that *An. aconitus* is strongly attracted to water buffalo and the cow. The density of *An. aconitus* both landing on man and resting indoors, where the cattle shelter was located 20 meters from the house and houses without cattle shelter were not significantly different (P0.05). The density of *An.aconitus* indoors on the various locations of cows and buffaloes shelter were not significantly different (P0.05). These results indicate that there was no significant difference in the attraction of *An aconitus* to cows as well as buffaloes. Bruce-Chwatt stated that genetic

factors of mosquitoes would be very important in determining the host-seeking behaviour[5]. Kirnowardoyo and Supalin revealed that the man-cattle ratio is not the main factor in determining the man-mosquito contact[6]. However, in order to survive in a harsh environment, adaptation of mosquitoes will occur and frequently zoophylic species will become anthropophylic in the absence of cattle or other mammals. Joshi et al. reported that *An. aconitus* is highly zoophylic, more than 90% of the population fed on bovine animals[1]. Precipitin test results of total of 100 *An.aconitus* blood meals from natural outdoor collections in this study (man-cattle ratio 13.1 : 1), show that 51.0 % of this species prefer feeding on cows, 21.0 % on buffaloes and only 3.0 % feed on man (Table 2).

Table 2. Precipitin test of **An. aconitus** blood meals *)

No. Tested	Percent (%) blood meals positive for					
	Man	Goat	Sheep	Cow	Buffalo	Unidentified
100	3.0	4.0	12.0	51.0	21.0	9.0

*) Mosquitoes were collected from natural outdoor shelters.

However in Kalibenda village, Banjarnegara regency where the man-cattle ratio is low (57 : 1), 57.4 % of *An. aconitus* population were found feeding on man[7].

CONCLUSION

If the cattle shelters are located inside or attached to the dwellings, it appears to increase vector densities indoors and thereby increasing man-vector contact. However if the cattle shelter is located at a distance of 20 meters approximately, the vector densities indoors is significantly reduced. This study also indicates that there was no significant difference in the attractiveness of water buffaloes and cows to *An. aconitus*.

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